

WHAT IS CLAIMED IS:

1. An optical disc comprising:
 - a first substrate;
 - a reflective layer;
 - an optically transparent second substrate, wherein the second substrate is disposed between the reflective layer and a light incident surface of the optical disc;
 - a data layer disposed between the second substrate and the reflective layer; and
 - at least one optically transparent sensor spot, wherein the at least one sensor spot is disposed between the second substrate and the light incident surface.
2. The optical disc as in claim 1, wherein the second substrate comprises a polycarbonate, a polycarbonate copolymer, or a polycarbonate blend with a glass transition temperature of at least about 100°C.
3. The optical disc as in claim 1, wherein light transmission of the at least one sensor spot is modulated by environmental stimuli.
4. The optical disc as in claim 1, further comprising a highly reproducible sensor array for producing a prerecorded standard response.
5. The optical disc as in claim 1, wherein the data layer includes digital information on a location of the at least one sensor spot.
6. The optical disc as in claim 5, further comprising a triggering mark for determining the location of the at least one sensor spot independent of the digital information in the data layer.
7. The optical disc as in claim 5, further comprising a triggering mark for determining the location of the at least one sensor spot independent of the digital information in the data layer, where the trigger mark serves simultaneously as an internal reference for providing information about a state of the optical disc.

8. The optical disc as in claim 6, further comprising a sensor spot pattern for determining the location of the at least one sensor spot independent of the digital information in the data layer.

9. A system for quantifying compounds in fluids, gases, vapors, and solids, the system comprising:

a disc drive for supporting and rotating an optical disc including at least one sensor spot;

a light source for directing light onto the at least one sensor spot;

at least one optical pickup for detecting light transmitted through the at least one sensor spot, the transmitted light being indicative of a concentration of a compound; and

an analog-to-digital converter for quantifying an intensity of the transmitted light.

10. The system as in claim 9, wherein the optical disc includes digital data, and the system further comprises a digital-to-analog converter for reading the digital data from the at least one optical pickup.

11. The system of claim 10, wherein the digital data includes information on a location of the at least one sensor spot.

12. The system as in claim 9, further comprising a filter coupled between the at least one optical pickup and the analog-to-digital converter for filtering noise.

13. The system as in claim 9, wherein the optical disc includes a highly reproducible sensor array for producing a prerecorded standard response.

14. The system as in claim 13, further comprising a processor for comparing measured intensity of the transmitted light to the prerecorded standard response.

15. The system as in claim 9, further comprising a memory for storing a prerecorded standard response and a processor for comparing measured intensity of the transmitted light to the prerecorded standard response.

16. The system as in claim 9, further comprising a vapor induction port for inducing vapor across the optical disc while being supported by the disc drive.

17. The system as in claim 9, further comprising a heater for heating the at least one sensor spot on the optical disc.

18. The system as in claim 10, wherein the optical disc further comprises a triggering mark for determining a location of the at least one sensor spot independent of the digital data.

19. The system as in claim 10, wherein the optical disc further comprises a triggering mark for determining a location of the at least one sensor spot independent of the digital data, where the trigger mark serves simultaneously as an internal reference for providing information about at least one state of the optical disc.

20. The system as in claim 10, wherein the optical disc further comprises a sensor spot pattern for determining a location of the at least one sensor spot independent of the digital data.

21. The system as in claim 9, further comprising a processor for performing precision-improvement analysis on the measured intensity of the transmitted light, wherein the precision-improvement analysis includes summing, averaging, Fourier filtering or Savitsky-Golay filtering of multiple readings of the intensity of the transmitted light.

22. A system for quantifying signal kinetics of compounds in gasses, vapors or liquids to a chemically or physically responsive sensor spot, the system comprising:

a disc drive for supporting and rotating an optical disc including at least one sensor spot;

a light source for directing light onto the at least one sensor spot;

at least one optical pickup for detecting light transmitted from the at least one sensor spot, the transmitted light being indicative of a concentration of a compound;

an analog-to-digital converter for quantifying an intensity of the transmitted light; and

an internal system clock capable of providing precise timing for temporal analysis of the intensity of the transmitted light.

23. The system as in claim 22, where the signal kinetics is provided by chemical, mechanical, physical changes in the optical disc.

24. The system as in claim 22, where the signal kinetics is provided by chemical reactions, diffusion, aging, biomolecular binding, dissolution, and photodegradation.

25. In a system including a disc drive for supporting and rotating an optical disc, a light source for directing light onto the optical disc, at least one optical pickup for detecting light transmitted from the optical disc, and an analog-to-digital converter for quantifying an intensity of the transmitted light, a method for quantifying a compound on the optical disc, the method comprising the steps of:

preparing the optical disc with a plurality of sensor spots, each of the sensor spots being responsive to a compound;

exposing the optical disc to a fluid, vapor, or gas;

measuring intensity of transmitted light from at least one of the plurality of sensor spots; and

correlating the measured intensity of light to an amount of compound exposed to the optical disc.

26. The method as in claim 25, further comprising the step of measuring an intensity of transmitted light from at least one of the plurality of sensor spots before exposing the optical disc to obtain a baseline reading.

27. The method as in claim 26, further comprising the step of correlating the baseline reading to the measured intensity of transmitted light of the exposed disc to quantify the amount of compound in the exposed disc.

28. The method as in claim 25, wherein the measuring intensity step begins when a predetermined trigger feature is detected on the optical disc.

29. The method as in claim 25, wherein the measuring intensity step begins when a predetermined trigger feature is detected on the optical disc, where the trigger feature simultaneously serves as an internal reference for providing information about a state of the optical disc.

30. The method as in claim 25, wherein the system further includes a vapor induction port, further comprising the step of inducing vapor across the optical disc while the optical disc is being supported by the disc drive.

31. The method as in claim 25, wherein the measuring intensity step begins when a predetermined pattern is located within a measured data stream from multiple revolutions of the disc, and subsets of data are extracted, each of which correspond to a single revolution.

32. The method as in claim 25, wherein the system further includes a heater, further comprising the step of heating the at least one sensor spot.

33. A networked sensor system for quantifying fluids, gases and vapors, the system comprising:

a plurality of sensor devices comprising:

 a disc drive for supporting and rotating an optical disc including at least one sensor spot;

 a light source for directing light onto the at least one sensor spot;

 at least one optical pickup for detecting light transmitted through the at least one sensor spot, the transmitted light being indicative of a concentration of a compound; and

 an analog-to-digital converter for quantifying an intensity of the transmitted light;

 central processing unit for processing signals received from the plurality of sensor devices; and

network for coupling the plurality of sensor devices to the central processing unit.

34. The system as in claim 33, wherein at least one of the plurality of sensor devices is a stand-alone optical drive having a network interface card.

35. The system as in claim 34, wherein the network interface card communicates to the central processing unit via a wireless communication link.

36. The system as in claim 33, wherein at least one of the plurality of sensor devices is a stand-alone optical drive coupled via a local bus to a network interface device.

37. The system as in claim 33, wherein at least one of the plurality of sensor devices is an internal optical drive mounted in a computer.

38. The system as in claim 33, wherein the plurality of sensor devices provide a multiplexed sensor array capable of determining multiple independent or duplicate analyte concentrations.

39. The system as in claim 33, wherein the plurality of sensor devices monitor movement of a particular analyte across a spatial region.

40. The system as in claim 33, wherein the plurality of sensor devices monitor presence or movement of biomaterials or organisms as they move through air or vapors in a particular location or plurality of locations.

41. The system as in claim 33, wherein the at least one sensor spot is responsive to salinity, process rinsing, ion content in liquids, process water, environmental water, and human consumption water.

42. The system as in claim 33, wherein at least one of the plurality of sensor devices further comprises a vapor induction port for inducing vapor across the optical disc while being supported by the disc drive.

43. The system as in claim 33, wherein at least one of the plurality of sensor devices further comprises a heater for heating the at least one sensor spot on the optical disc.